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From Margins to Circular Partners: A Pathway for Waste Picker Integration in King Sabata Dalindyebo (KSD) Local Municipality

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Abstract

Waste pickers play a critical yet underrecognized role in South Africa's waste management and circular economy by recovering recyclable materials, reducing waste sent to landfills, and supporting resource recovery. Using focus groups, document analysis and semi-structured interviews, this paper evaluates the status of waste picker integration in KSD Local Municipality against the seven-step waste picker integration guidelines developed by the Department of Environment, Forestry and Fisheries. The findings revealed that women constituted 67.5% of the surveyed waste pickers, while 60% had completed secondary education. Cooperative or waste picker group membership was reported by 55% of participants, and 52.5% had received training. Participants identified inadequate transport (92.5%), storage facilities (77.5%), collection equipment (67.5%), and protective gear (45%) as major operational challenges. Municipal engagement, cooperative development and training were evident, but participants said they were not fully integrated into formal waste management arrangements. Municipal documents analyzed showed commitments to recycling infrastructure and cooperative development but few explicit provisions for waste picker recognition, representation and participation in decision-making. The study shows how recycling initiatives do not translate into institutional inclusion of informal waste pickers. Formal recognition, participatory governance, infrastructure access, occupational protection and partnerships with recycling companies could support inclusive waste management and circular economy practices in KSDLM.

Keywords: waste picker integration; cooperatives; informal recycling sector; circular economy; sustainable livelihoods; integrated waste management

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1. Introduction

Informal waste picking has been considered a livelihood practice in many countries, particularly in the informal sector where economic necessities are the primary forces behind waste utilization and recycling [1]. Waste pickers in the Global South are key players within a circular economy, serving as essential agents in waste management structures, especially when these are organized at local and regional collective levels [2]. Within the context of the circular economy, they include waste pickers and small informal private companies in Brazil and cooperative recyclers in the Philippines, through scrap metal scavengers in Spain and semi-formal recycling networks in China and Hong Kong [3,4]. Despite their substantial role in waste reduction and resource recovery, informal recyclers are often subject to widespread systemic exclusion, work in hazardous settings and are targeted for

allegations of theft. Stigmatizing stereotypes, perceived as thieves or homeless individuals, impose severe risks to social safety and security and contribute to their marginalization in urban waste management frameworks [5–7].

The practice of waste picking has long been a marginal one, resulting in social and institutional exclusion, despite its fundamental role in waste management and recycling [8]. Waste picking is a socially stigmatized field, so waste pickers are seen as outsiders rather than professionals who perform a vital service. They are marginalized and treated as such not only in terms of social perceptions but also in terms of the way the system and policies are structured for them [9]. While programs and policies initiated by scholars and policymakers with the best of intentions often fail to recognize the ways that the very materials waste pickers work with entrench their socio-economic dispossession and exclusion from the normal economic and social structures within which they operate [10]. This ongoing systemic disadvantage persists despite significant contributions from waste pickers towards bettering environmental sustainability and resource recovery.

Although waste pickers are critically important in promoting recycling and circular economy solutions throughout the world, their activities are largely performed in more informal settings with fragile work conditions, economic vulnerability, and low social recognition. Existing research [11–13] confirms that waste pickers are still excluded from the formal framework of waste management since legislation in many cases does not recognize them as legitimate actors in the waste management chain. The exclusion of such persons reinforces a regulatory void that undermines efficient integration and equitable participation. Additionally, existing top-down waste management approaches entrench structural inequality by enabling intermediaries to exploit waste pickers, making them vulnerable to dynamic market shifts and continuing marginalization [14]. Cooperative formations and stand-alone inclusion programs that have been attempted have not prevented systemic barriers or provided social/economic integration. Hence, a significant research gap persists in identifying regionally specific, inclusive, and sustainable routes for incorporating waste pickers into formal waste management pathways, especially in municipalities such as KSD, where the socio-economic fabric of these areas and local governing mechanisms make such routes challenging to identify.

Circular Economy (CE), Ecological Economics (EE) and Social and Solidarity Economy (SSE) are complementary theoretical frameworks for understanding the environmental, economic, and social aspects of waste picker integration. CE builds on concepts from urban metabolism, industrial ecology, systems theory, and cradle-to-cradle approaches to promote resource efficiency by transforming linear patterns of production and consumption into circular systems in which materials are recovered, reused, and recycled [15]. In this framework, waste pickers directly contribute to circularity because they recover valuable materials from waste streams, reduce losses of resources, and redirect recyclable material into productive economic activities. Their practical knowledge of waste separation, material recovery and recycling markets makes them important contributors to sustainable urban resource management [2,15], but conventional CE has been criticized as being too focused on material flows, resource efficiency and technological innovation without attention to social justice, labor conditions, unequal power relations and livelihoods of informal workers, especially in the Global South [15].

To address these limitations, the concept of an Amended Circular Economy incorporates principles from EE and SSE to provide a more socially inclusive and environmentally responsible framework for sustainable resource management [15]. Ecological Economics recognizes that economic activities, ecological systems, and human well-being are interlinked; economic development must take place within environmental limits, but at the same time social equity is promoted. When applied to waste picker integration, they indicate

that environmental resources need protecting, but waste management interventions must be responsive to livelihoods, working conditions and vulnerabilities of informal recyclers, too. From this perspective, sustainable waste management is not just about increasing recycling efficiency; it also requires institutional arrangements that balance ecological sustainability with economic security and social well-being. The Social and Solidarity Economy complements this ecological perspective with collective well-being, democratic participation, cooperation, solidarity, autonomy and reciprocity as core principles of economic organization [15]. Instead of profit maximization, SSE promotes economic activities that improve social welfare (equal distribution of resources), community empowerment (environmental sustainability) and environmental protection. It covers a range of organizational arrangements such as cooperatives, associations, community enterprises and solidarity-based networks through which people collectively participate in economic decision-making and resource management. These principles form the basis for understanding how collective organization, cooperative governance and participatory decision-making can increase bargaining power recognition and economic opportunities for informal recyclers in waste picking.

The integration of CE, EE, and SSE within an Amended Circular Economy framework is particularly relevant to waste management systems in the Global South, where informal recycling is closely connected to poverty, unemployment, limited municipal service capacity, and livelihood insecurity [15]. CE focuses on material recovery and resource circularity; EE on ecological responsibility and adaptive governance; and SSE on social inclusion, collective organization, and equitable economic participation. Taken together, these perspectives do not see waste pickers as merely recyclers but also as economic actors, environmental contributors, and legitimate partners in sustainable waste governance. Integrated theoretical approaches like this one also recognize that a socially just transition towards circular waste economies requires institutional arrangements that protect existing livelihoods while providing opportunities for meaningful participation and economic advancement [2,14,15].

Waste picker cooperatives represent an important mechanism through which the principles of the Amended Circular Economy can be translated into practice. There have been organized advocacy campaigns in recent years that have helped to better raise awareness of the rights and contributions of waste pickers [2]. For instance, in South Africa, the collaboration between waste picker associations, environmental justice organizations, and academic researchers has sought to reform policy frameworks with the publication of official Waste Picker Integration Guidelines that acknowledge waste pickers' value, dignity, and expertise [16,17]. The effectiveness of inclusive formalization plans greatly depends on the empowerment of waste pickers to influence policies, as seen in the different results observed in urban contexts such as Bogotá compared to São Paulo, where formalization methods have been more beneficial to a smaller group of street waste pickers due to the limited participation of waste pickers in policymaking [18].

Waste pickers can be integrated into formal waste management systems through the seven-step framework implemented by DEFF, consisting of Prepare, Partner, Plan, Enable, Institutionalize, Implement, and Revise, which is structured to ensure the process of recognition and long-term, sustainable participation [16]. First, municipalities must formally recognize waste pickers as legitimate people who are able to make a significant contribution to waste management, recycling, and the circular economy [19]. Then, those steps also call for a regular and ongoing dialogue with waste pickers and their organizations to be conducted so that their knowledge, needs, and priorities are included in integration processes [7,17]. The seventh step is the monitoring, evaluation, and further improvement of integration initiatives: to monitor the effectiveness of integration programs that are being implemented, identify obstacles, and adjust interventions to make sure that integration

is inclusive, equitable and sustainable [16]. Taken together, these seven steps show that meaningful integration is not about formalizing waste-picking activities but about how the environment and communities are inclusive and rights-based and how waste pickers are recognized as knowledgeable and useful partners in the urban circular economy. As such, for King Sabata Dalindyebo Local Municipality, the framework is an important assessment to see if current municipal practice addresses the social, institutional, economic, and operational aspects required for sustainable waste picker integration.

Integrating waste pickers into formal waste management frameworks, however, is still difficult. Moreover, isolated integration programs have proven insufficient in achieving long-term social and economic inclusion, highlighting the need for more holistic, participatory, and locally grounded strategies. It is against this background that this study seeks to evaluate the status of waste picker integration in King Sabata Dalindyebo Local Municipality against the seven-step guidelines of the Department of Environment, Forestry and Fisheries. This paper aims to critically identify barriers and opportunities for inclusion, investigate institutional and policy gaps, and suggest ways in which waste pickers can be transformed from marginalized actors to recognized circular partners in sustainable urban waste management.

2. Materials and Methods

2.1. Research Design

This study employed a qualitative-dominant mixed-methods case study to assess the status of waste picker integration within King Sabata Dalindyebo (KSD) Local Municipality, Eastern Cape Province, South Africa. A case study design was deemed suitable for examining the intricate social, institutional and policy factors influencing the management of waste pickers' place in a particular local governance context. The mixed-methods approach facilitated the collection and interpretation of both qualitative and quantitative data, allowing the study to examine waste pickers' experiences and perceptions alongside descriptive patterns of municipal engagement, institutional support, cooperative participation, and integration status.

The qualitative component was the main methodological approach used (lived experiences of waste pickers; institutional relationships; working conditions and barriers to integration). Qualitative data were collected through semi-structured interviews, focus group discussions, document analysis and non-participant field observations. Quantitative data were collected through structured questionnaire data from 40 waste pickers describing socio-demographic characteristics, participation in cooperatives, municipal support access, training opportunities and perceived integration status. The quantitative findings were used as complements to and context for the qualitative evidence rather than causal relationships or statistically generalizable estimates.

The study was guided by the Department of Environment, Forestry and Fisheries (DEFF) Seven-Step Waste Picker Integration Guidelines, comprising Prepare, Partner, Plan, Enable, Institutionalize, Implement, and Revise [16]. This framework provided an analytical basis for examining the extent to which municipal waste management practices recognize, support, protect, and integrate informal waste pickers. The framework also informed the development of data collection instruments, the organization of qualitative themes, and the interpretation of findings relating to institutional readiness, stakeholder participation, municipal partnerships, and implementation challenges.

2.2. Study Area

The study was conducted in King Sabata Dalindyebo Local Municipality, Eastern Cape Province, South Africa. This municipality consists of urban, peri-urban, and rural

areas, with Mthatha at the center as the economic and administrative center. KSDLM faces persistent challenges regarding waste management, including illegal dumping, limited landfill capacity, high unemployment, and reliance on informal economic activities [20].

Waste disposal has become one of the bigger issues, not just in KSDLM but also in different localities within the District, Province, and national levels throughout South Africa. In response to these challenges, the municipality has undertaken initiatives aimed at improving environmental awareness and encouraging community participation in sustainable waste management. These include engagements with the Municipal Infrastructure Support Agent (MISA) to explore innovative waste management approaches and promote waste-related economic opportunities [21]. Such initiatives reflect an increasing recognition of the potential contribution of waste recovery and recycling activities to environmental sustainability and local economic development [22].

KSDLM was purposively selected as a case study because its waste management challenges, informal recycling activities, and emerging municipal initiatives provide a relevant context for examining waste picker integration. The coexistence of informal waste recovery activities and municipal efforts to strengthen waste management creates an opportunity to assess the extent to which national waste picker integration guidelines are reflected in local institutional arrangements and operational practices. Moreover, the municipality's combination of urban, peri-urban, and rural settlements is a useful setting to study variation in waste picking activities, access to recycling markets, municipal engagement, and livelihood opportunities. KSDLM was therefore chosen because it fit the research objectives and provides context-specific knowledge on opportunities and barriers to integrate informal waste pickers into municipal waste management systems.

2.3. Sampling

The sample for the study consisted of three main stakeholder groups: informal waste pickers working at landfill sites, illegal dumping hotspots, and street collection points in KSDLM; municipal officials working on waste management, environmental health, and local economic development; and key informants, including representatives from recycling companies, waste intermediaries, community leaders, and civil society or environmental justice organizations working with waste pickers.

A combination of purposive and snowball sampling techniques was employed. Purposive sampling was used to identify participants with direct experience of waste picking or relevant institutional knowledge of waste picker integration. This approach ensured that participants could provide information relevant to the research objectives. Snowball sampling was subsequently used to identify additional informal waste pickers, particularly those who were not affiliated with formally recognized groups or cooperatives and were therefore less accessible through established institutional networks.

The inclusion criteria for waste pickers were: (i) actively participating in informal waste collection, sorting, recovery, or recycling within KSDLM at the time of the study; (ii) having direct experience of waste picking activities within the municipality; and (iii) being willing to participate voluntarily and provide informed consent. Municipal officials and key informants were eligible for inclusion if their professional responsibilities, organizational involvement, or practical experience were relevant to waste management, recycling, or waste picker integration within KSDLM.

A total of 40 informal waste pickers participated in the study. In addition, 3 municipal officials and 2 key informants were interviewed, resulting in an overall sample of 45 participants. The selection of participants was intended to capture a range of experiences and institutional perspectives rather than achieve statistical representativeness.

2.4. Data Collection Methods

The data collection instruments included a questionnaire, semi-structured interview guides, focus group discussion guides, and observation checklists. These instruments were developed in alignment with the study objectives and the DEFF Seven-Step Waste Picker Integration Guidelines to ensure that relevant dimensions of waste picker integration were examined.

- Questionnaire surveys: A questionnaire was administered to 40 informal waste pickers to obtain quantitative information about socio-demographic characteristics (gender, age, education level, duration of waste picking activity), waste picking activities (cooperative membership, training, municipal support), institutional engagement (interactions with institutions), and integration experiences (perception of status). Questions were asked on gender, age, education level, duration of waste picking activity, cooperative membership, training, municipal support, interactions with private recycling companies and perceived status as an integrated person.
  The questionnaire contained mostly closed questions so that frequencies and percentages could be calculated. The survey gave descriptive information about characteristics and experiences of participating waste pickers and supplemented qualitative findings (focus group discussions).
- Interviews: Semi-structured interviews were conducted with municipal officials focused on existing waste management policies, institutional arrangements, municipal capacity, stakeholder engagement, available support mechanisms, and challenges associated with implementing waste picker integration initiatives. Key informant interviews explored relationships between informal waste pickers, recycling companies, intermediaries, and other relevant stakeholders.
  Interviews were documented through written notes; interview notes were reviewed to identify relevant information and recurring themes.
- Focus Groups: Five focus group discussions were conducted with informal waste pickers, with each group comprising four participants, resulting in 20 focus group participants. The discussions provided an opportunity to explore shared experiences and collective perspectives on waste picker integration. Working conditions, municipal engagement, access to recycling markets, cooperative organization, solidarity practices, power relations with waste intermediaries and perceived opportunities for integration were discussed. Group discussions also covered common challenges and locally appropriate strategies for strengthening waste picker participation in municipal waste management systems. The focus groups were facilitated using a discussion guide consisting of open-ended questions aligned with the study objectives. Participants were encouraged to share their experiences and respond to issues raised by other group members, allowing similarities and differences in perspectives to emerge. Each discussion lasted approximately 45 min and was conducted in IsiXhosa. Discussions were documented through detailed notes. The resulting data were translated and included in the qualitative thematic analysis.
- Document and Policy Analysis was undertaken to examine the extent to which waste pickers were recognized and supported within existing national and municipal waste management policy frameworks. The analysis focused on identifying provisions relating to informal recycling, stakeholder participation, cooperative development, livelihood support, institutional responsibilities, and the implementation of waste picker integration initiatives. The documents reviewed were the DEFF Seven-Step Waste Picker Integration Guidelines; KSDLM IDPs where relevant; municipal waste management by-laws; informal trading by-laws and, where available, additional municipal waste management plans and related policy documents to establish institutional and

regulatory context for waste picker integration.

Documents were selected based on their relevance to waste management governance, applicability to KSDLM and evidence of institutional recognition or support for informal waste pickers. The analysis involved reading each document and extracting information relating to the seven stages of the DEFF integration framework. Particular attention was given to references to waste picker identification and registration, stakeholder consultation, cooperative formation, training, infrastructure provision, institutional partnerships, implementation arrangements, and monitoring mechanisms. The extracted information was put into a document analysis matrix to compare policy provisions with evidence from interviews, focus group discussions and field observations so that the study could identify where national policy expectations matched municipal planning commitments and where they did not match reported implementation practices.

- Field Observations: Non-participatory observations were made at landfill and informal recycling sites and included work conditions, health hazards, material recovery methods, and the interactions of waste pickers, municipal workers, and private entities to provide context for interview data.

2.5. Data Analysis

Quantitative questionnaire data were entered, organized, and analyzed using Microsoft Excel (Microsoft Corporation is headquartered in Redmond, WA, USA). Descriptive statistics, including frequencies, percentages, and means, were used to summarize the findings, which were presented in tables, charts, and graphs. Cross-tabulations were also employed to examine relationships between selected variables and identify similarities and differences in participants' responses.

Qualitative data from semi-structured interviews, focus group discussions, field observations and document analysis were analyzed using thematic content analysis. Written interview notes, detailed focus group discussion notes, observation records and relevant policy documents were used as the material for analysis. As the interviews and focus group discussions were documented through written notes, the analysis did not rely on verbatim interview or focus group transcripts.

The focus group discussions were held in IsiXhosa, and the material documented was translated into English for thematic interpretation and reporting. Qualitative material was organized according to research objectives and examined to identify recurring experiences, perceptions, and institutional challenges around waste picker integration.

Deductive and inductive coding guided thematic analysis. Deductive coding was based on the seven stages of DEFF Waste Picker Integration Guidelines (Prepare, Partner, Plan, Enable, Institutionalize, Implement, Revise). These categories helped to frame institutional engagement, stakeholder participation, municipal support, organizational development, and implementation challenges. Inductive coding identified additional themes emerging from participants' experiences (occupational risks; infrastructure limitations; cooperative organization; access to recycling markets; social recognition; institutional exclusion).

The identified themes were compared across interviews, focus group discussions, field observations and documentary evidence to see what was similar, different and where convergence occurred. Document analysis focused on how much municipal policies and planning instruments recognized informal waste pickers and provided means for participation in waste management activities. Findings from the different qualitative sources were compared with descriptive questionnaire results to develop a context of waste picker integration in KSDLM.

This process helped triangulate the evidence and allowed the study to distinguish differences between municipal policy commitments, reported institutional practices and waste pickers' experiences of integration.

3. Results

Waste pickers play a crucial role in the informal recycling sector and make an important contribution to waste management and resource recovery.

3.1. Socio-Demographic Profile of Waste Pickers

Table 1 shows the distribution of gender, age, and literacy levels among study participants. Females made up 67.5% of the sample, while males made up 32.5%. Most participants were over 50 years old (47.5%), while fewer aged 41–50 (27.5%) and under 40 (25%) were present. No young people were present under 20, meaning that waste picking in KSD Local Municipality is mainly for the elderly, which may be because there are fewer jobs for this group.

Table 1. Demographic characteristics of participants ($n = 40$).

Variable	Category	Percentage (%)
Gender	Male	32.5
	Female	67.5
Age	Below 20 years old	0
	21–30 years old	12.5
	31–40 years old	12.5
	41–50 years old	27.5
	Above 50 years old	47.5
Literacy Levels	No formal education	0
	Primary education	32.5
	Secondary education	60
	Tertiary education	7.5

In terms of literacy, 60% of the participants had secondary education, 32.5% primary education, and 7.5% tertiary education, with no participants lacking formal education. The relatively high proportion of participants with secondary education indicates that participation in waste picking was not confined to individuals without formal education. The presence of secondary education also highlights the difficulty of stable work in the formal economy.

The duration of engagement amongst participants in waste picking is depicted in Figure 1. The results show that the highest percentage of the participants (40%) have been in waste picking for 4 to 6 years. Next, 32.5% had over 6 years of experience; 20% of participants had between 1 and 3 years of waste picking experience; and only 7.5% reported less than 1 year of experience as shown in Figure 1.

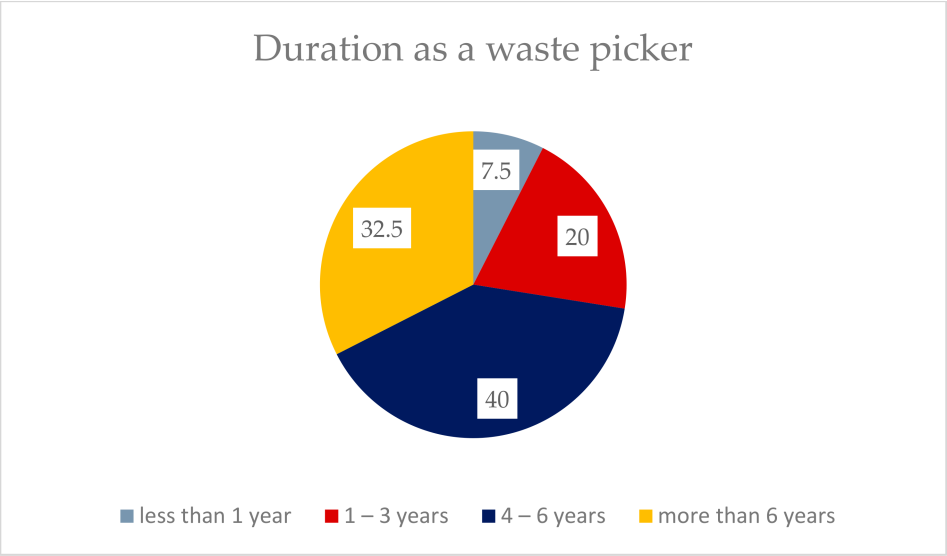


Figure 1. Duration of participants' involvement in waste picking ($n = 40$).

3.2. Municipal Support for Waste Pickers

Figure 2 below illustrates whether participants in the study had been contacted by the municipality. The findings show that most participants (85%) indicated that they had been contacted by the municipality, while only 15% reported that they had not been contacted. Communication with the municipality is on a weekly basis in the form of a meeting; there is also a WhatsApp group between the waste pickers and the municipality personnel to strengthen communication.

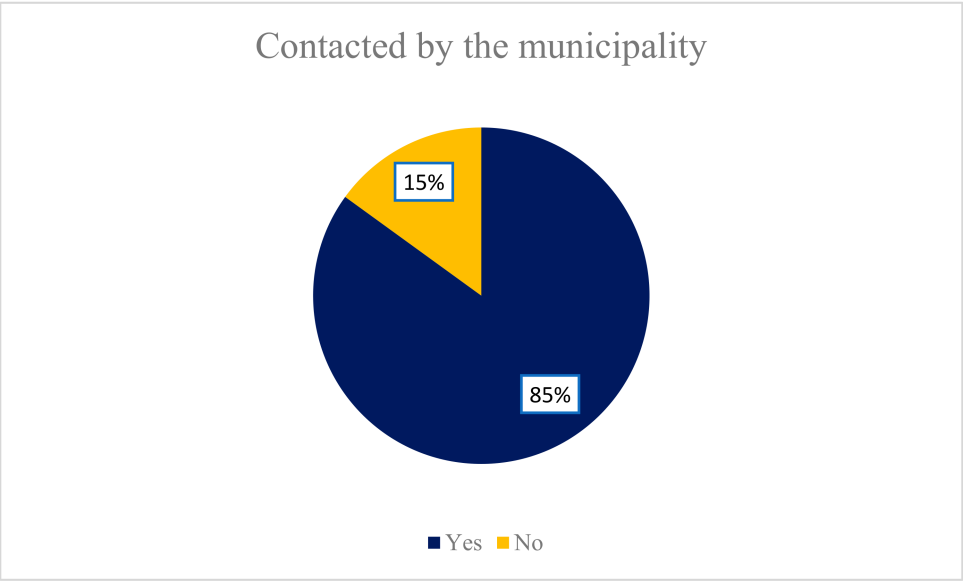


Figure 2. Participants' responses on whether they had been contacted by the municipality regarding waste picker integration initiatives in KSD Local Municipality ($n = 40$).

Figure 3 shows that 60% of participants received municipal support, while 40% did not. This suggests the municipality has taken steps to include waste pickers in local waste management, such as registering cooperatives, providing recycling access, offering protective gear and training, and involving them in waste management discussions.

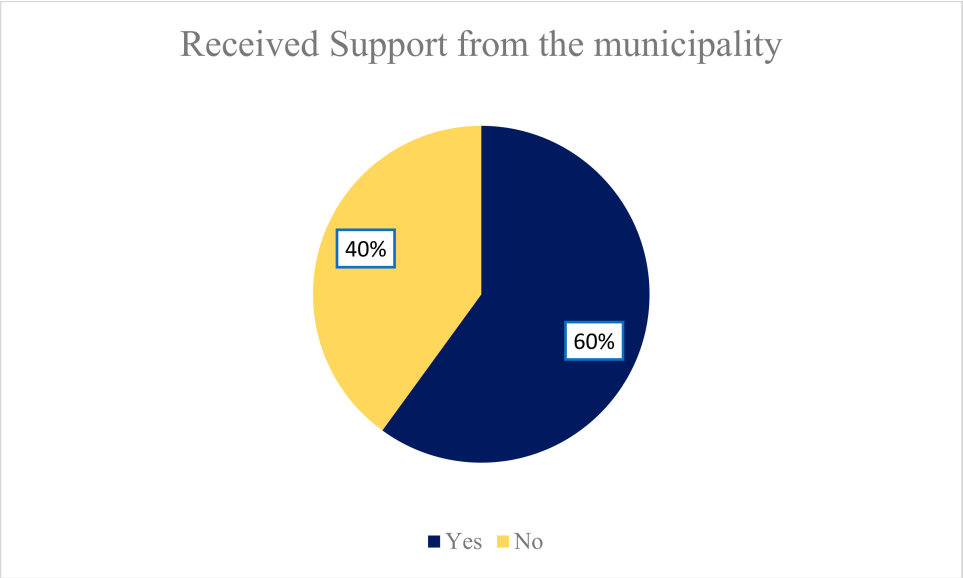


Figure 3. Participants' responses regarding the support provided by the municipality ($n = 40$).

Figure 4 shows comparisons of two types of support given by the municipality; 54.2% of support comes from technical support, and material support accounts for 45.8%, where physical resources also play a part in aid. The percentages are thus so close that it seems this municipality is attempting to do a combination of practically useful resources and expertise support, with some tendency towards the technical ones.

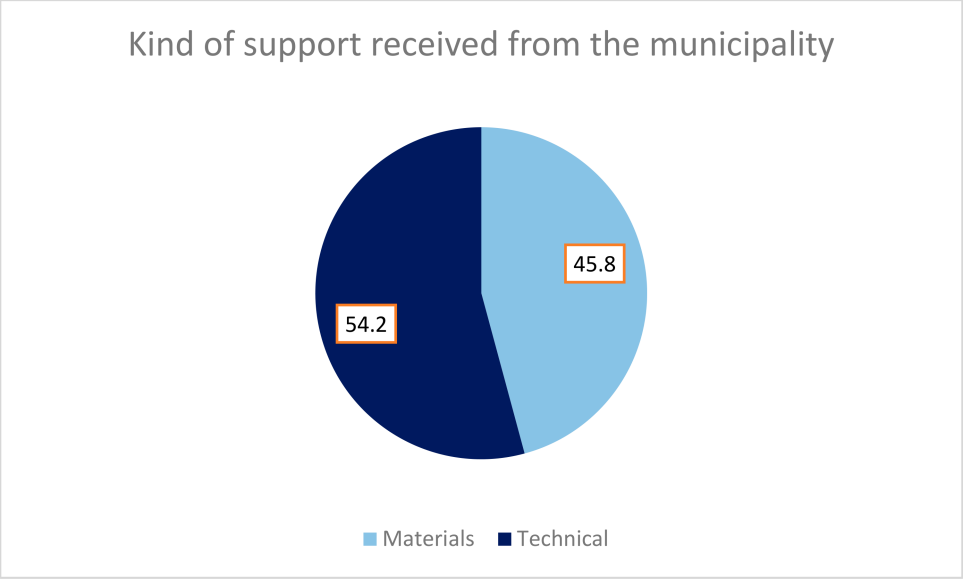


Figure 4. KSD local municipality support towards waste pickers ($n = 24$).

The results in Figure 5 indicate that 42.5% of participants reported interacting with private recycling companies, while the majority, 57.5%, stated that they did not have such interactions. The findings suggest that although some waste pickers are linked to private recycling companies, a large proportion remain disconnected from formal recycling markets.

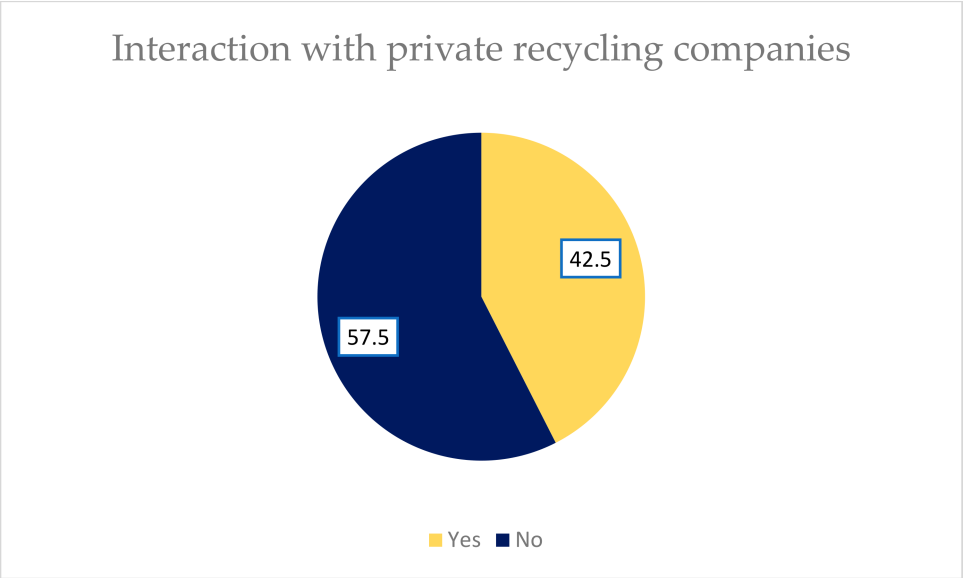


Figure 5. Waste pickers who interact with private recycling companies in KSD Local Municipality ($n = 40$).

3.3. Participation in Cooperatives

The study findings show that 55% ($n = 22$) of participants reported being members of a waste group, while 45% ($n = 18$) indicated that they were not affiliated with any group, as shown in Figure 6. The results suggest that slightly more than half of the participants are organized within waste picker cooperatives. This is a positive indication of emerging collective organization among waste pickers in KSD Local Municipality. Membership in waste groups can provide several benefits, including improved communication, collective bargaining power, shared resources, access to training opportunities, and stronger representation in engagements with municipalities and private recycling companies. A municipal official reported that approximately 300 waste pickers had been organized into cooperatives.

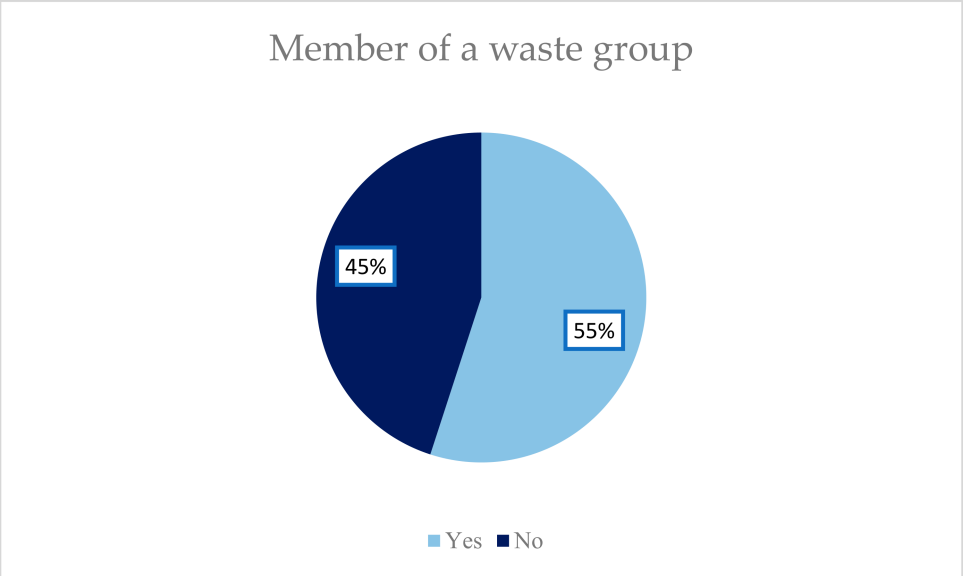


Figure 6. Distribution of participants according to membership in waste picker groups or cooperatives in KSD Local Municipality ($n = 40$).

The findings show that 45.5% (n =10) of cooperatives had existed for less than one year, 36.4% (n = 8) had been operating for 1–3 years, and 18.1% (n = 4) had existed for more than three years. Figure 7 showed that a majority of waste picker cooperatives in KSD local municipality are relatively new, which shows that waste picker cooperation and organization was a very new concept. This may also correlate with the latest efforts made by municipalities, NGOs, or even waste pickers to formalize and enhance their role in the recycling sector.

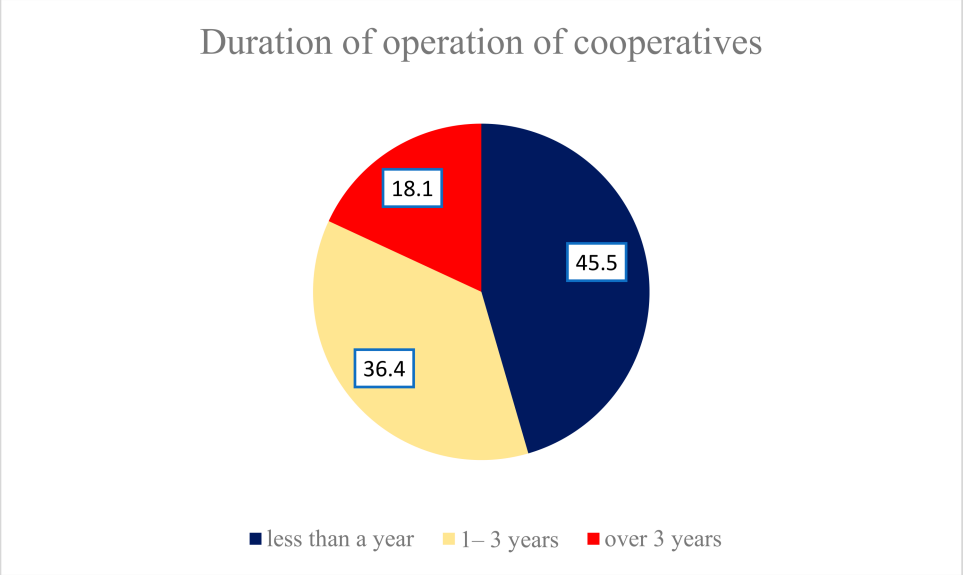


Figure 7. Participant-reported duration of operation of waste picker groups or cooperatives in KSD Local Municipality (n = 22).

The findings reveal that 52.5% of participants reported having received training, while 47.5% indicated that they had not received any training. The findings in Table 2 show that the majority of participants (80.95%) received training related to cooperative formation. This was followed by waste sorting training at 14.3%, health and safety training at 71.4%, and other forms of training at 4.8%. Training activities covered areas such as cooperative formation, waste sorting, recycling practices, occupational health and safety, environmental awareness, cooperative management, or business and entrepreneurship skills.

Table 2. Types of training received by waste pickers in KSD Local Municipality (multiple-response data, n = 21).

Kind of Training Received	Percentage (%)
Cooperative formation	80.95
Waste sorting	14.3
Health and safety	71.4
Other	4.8

3.4. Challenges Experienced by Waste Pickers

The findings in Table 3 reveal several major challenges faced by waste pickers; the challenge most often identified was lack of transport, reported by 92.5% of participants. This was followed by lack of storage facilities (77.5%), lack of collection equipment (67.5%), and inadequate safety gear (45%).

Table 3. Challenges faced by waste pickers (multiple-response data, $n = 40$).

Challenges	Percentage (%)
Lack of storage	77.5
Safety gear	45
Collection gear	67.5
Transport	92.5

The findings indicate that the majority (75%) of the participants were supported by the community, but 25% felt that they were not supported by the community as shown in Figure 8. The findings reveal that the waste pickers at KSD Local Municipality usually have positive relationships with members of the community. Increased perceived local support seems to reflect the increasing acknowledgment of the vital contribution waste pickers make to environmental cleanliness, waste reduction, and community recycling endeavors.

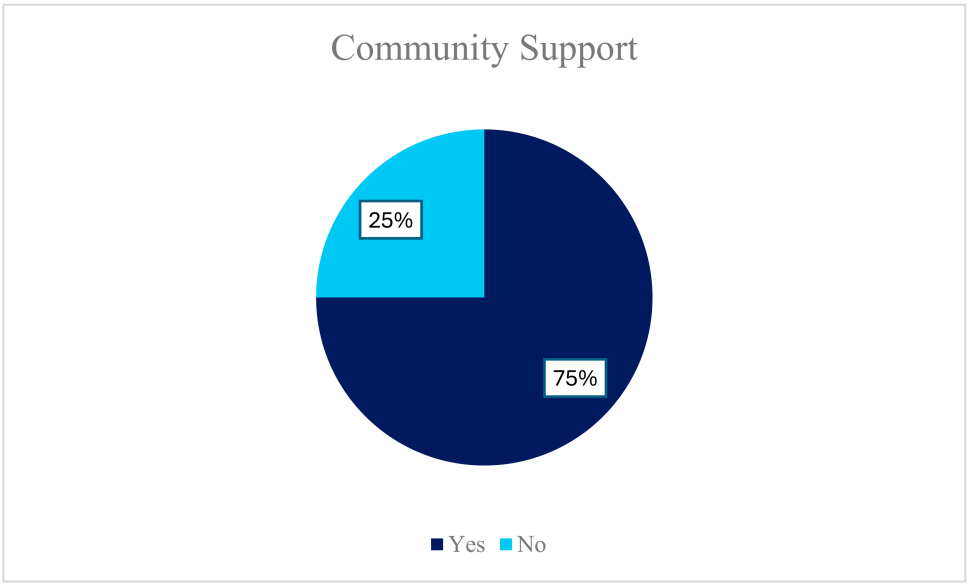


Figure 8. Participants' perceptions of community support toward waste pickers in KSD Local Municipality ($n = 40$).

Waste Pickers' Suggestions for Addressing Identified Challenges

Waste pickers identified the challenges they were experiencing, and they outlined some ways they could improve their working conditions and build their integration into the municipal waste management system. Most of their suggestions were to improve transport, storage and collection equipment, safety measures for workers, training and cooperation between waste pickers, and the municipality and private recycling companies. With transport being the most prevalent problem (92.5%), they stressed the need to have reliable and dedicated transportation to transport recyclable materials from collection points to storage and recycling facilities. "The absence of suitable transport limits the quantity of recyclable materials that I can collect and increases the physical burden and costs associated with transporting materials," said a waste picker in Ngangelizwe. The findings suggest that municipal provision of resources could improve or facilitate access to vehicles that could be shared by organized waste picker groups or cooperatives. Such an arrangement could enable waste pickers to transport larger quantities of recyclable materials and improve their access to recycling markets.

The scarcity of storage facilities was also identified by 77.5% of participants as one of the major limitations. Waste pickers identified secure storage areas where recycled materials

can be sorted, stored, and protected until they are ready to sell. It was claimed that these sites would reduce waste pickers' need to store materials in open spaces or around their homes and provide a more organized working environment. They also specified that storage must be located in close proximity to areas where waste pickers operate and should be handled in a cooperative. They also noted that there is a need for proper collection and sorting equipment. The lack of collection equipment was reported by 67.5 per cent of the participants. Waste pickers said that the municipality and any other relevant stakeholders should provide basic equipment such as collection bags, carts, trolleys, sorting tables, weighing scales and other tools. Participants indicated that such equipment would help with efficiency, reduce the physical strain of sorting recyclables, and allow them to deal with larger volumes of material. Equipment should also be distributed through recognized waste picker groups to promote collective responsibility and proper maintenance.

With regard to occupational health and safety, 45% of the participants reported that they had inadequate safety gear. Waste pickers said they should receive gloves, boots, protective clothing, and masks when they worked at landfills and illegal dumping sites. People also said they need to take health and safety training occasionally to know about occupational risks and safe waste handling practices. Communication and collaboration with the municipality was also a frequent recommendation. Although 85% of the participants were contacted by the municipality, participants said that communication should translate into more regular practical support and opportunities for participation in decision-making. Participants emphasized the importance of community awareness campaigns in improving public understanding and recognition of waste pickers' contributions to recycling and environmental sustainability. One landfill-based waste picker expressed this concern: "We need the municipality to conduct awareness campaigns in the communities where we live to educate the public about waste recycling, so that even our neighbors will understand and value the work we do" (waste pickers, landfill site). Waste pickers also advised that regular meetings and existing communication channels (WhatsApp groups, etc.) should be maintained and used to share information about municipal programs, training opportunities, equipment supply, collection activities and other activities that affect their jobs and living conditions. Waste pickers also highlighted the importance of involving waste pickers in decision-making and in how their work is done when making decisions on which waste collection area or recycling material can be collected, as it applies to them, and they know what is in their daily lives.

Waste pickers also noted that better links are needed with private recycling companies and recycling markets. Waste pickers observed that 57.5% of the participants had no contact with private recycling companies, and the municipality should support establishing a link between waste picker cooperatives and recycling companies. Such links could bring more reliable buyers and information about material prices and quality requirements to market and likely lead to more stable income streams. "Organized cooperatives are also seen as a keyway of organizing recyclable material and negotiating with recycling companies", one participant said.

3.5. Level of Integration

The study found that 52.5% of participants believe waste pickers are partially integrated into municipal waste management, while 47.5% say they are not integrated at all as shown in Figure 9. No participants identified them as fully integrated. This indicates that while there is some progress toward inclusion, integration is still incomplete. The majority view suggests that waste pickers may engage in municipal or recycling activities, such as communication, cooperative formation, or recycling initiatives, but lack full recognition and formal incorporation into the system.

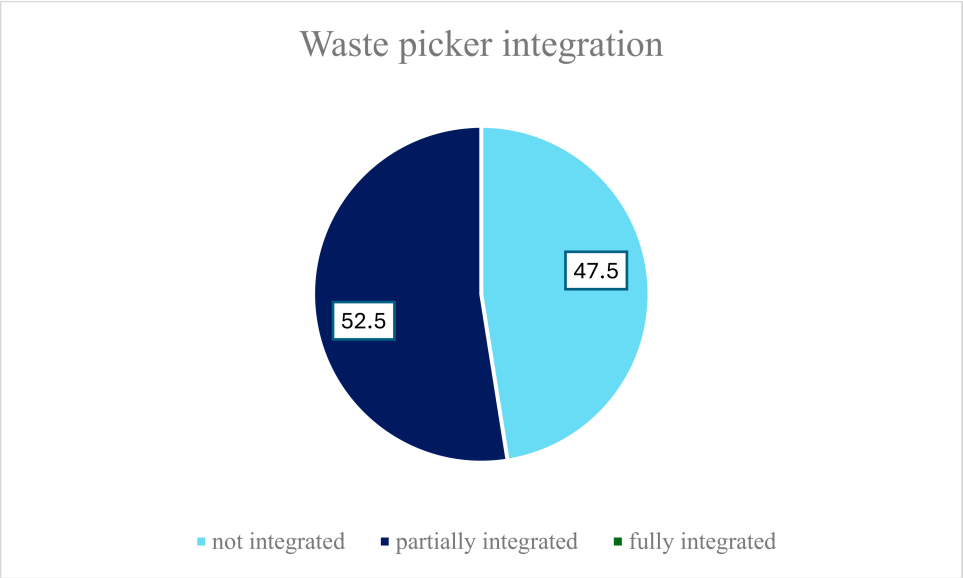


Figure 9. Level of waste picker integration into the waste management system in KSD Local Municipality ($n = 40$).

Table 4 presents the relationship between participants' gender and their perceptions of waste picker integration into the municipal waste management system. Among the 27 female participants, 15 (55.6%) reported that waste pickers are partially integrated. Twelve (44.4%) indicated that waste pickers are not integrated. This suggests that women were slightly more likely to perceive some progress toward integration. Given that women constituted the majority of the sample, their responses strongly influence the overall findings and reflect cautious optimism about ongoing integration efforts. Among the 13 male participants, six (46.2%) reported that waste pickers are partially integrated, and seven (53.8%) indicated that waste pickers are not integrated. Male participants were somewhat more likely than females to perceive that waste pickers remain excluded from the formal waste management system.

Table 4. Cross-tabulation between gender and level of waste picker integration in KSD Local Municipality ($n = 40$).

Gender	Partially Integrated	Not Integrated	Total
Female	15	12	27
Male	6	7	13
Total	21	19	40

Table 5 presents the distribution of participants' perceptions of waste picker integration according to whether they had received training. Among the 21 participants who reported receiving training, 18 (85.7%) perceived waste pickers as partially integrated into the municipal waste management system, while three (14.3%) considered them not integrated. In contrast, among the 19 participants who had not received training, three (15.8%) perceived partial integration, while 16 (84.2%) reported no integration.

These findings indicate a descriptive difference in perceived integration between participants who had received training and those who had not. Participants with training more frequently reported partial integration, whereas those without training more frequently perceived a lack of integration. This pattern may reflect differences in exposure to municipal programs, institutional communication, or opportunities for participation. However, because the analysis was limited to descriptive cross-tabulations, the findings

do not establish a statistically significant relationship or demonstrate that training directly improves integration.

Table 5. Cross-tabulation of training participation and perceived level of waste picker integration in KSD Local Municipality ($n = 40$).

Training	Partially Integrated	Not Integrated	Total
Yes	18	3	21
No	3	16	19
Total	21	19	40

Table 6 shows the distribution of participants' perceptions of waste picker integration depending on whether they reported municipal support: among the 24 participants who received municipal support, 20 (83.3%) perceived waste pickers as partially integrated and four (16.7%) as not integrated; among the 16 participants who did not receive municipal support, one (6.25%) reported partial integration and 15 (93.75%) reported waste pickers as not integrated.

Table 6. Cross-tabulation of municipal support received and perceived level of waste picker integration in KSD Local Municipality ($n = 40$).

Municipal Support	Partially Integrated	Not Integrated	Total
Yes	20	4	24
No	1	15	16
Total	21	19	40

The results show a descriptive difference in perceived integration between participants who reported receiving municipal support and those who did not. Participants with municipal support more often reported partial integration, whereas without support they mostly saw waste pickers as not integrated. This pattern implies that municipal engagement and assistance may be relevant to the experience of inclusion in waste management activities, but these are descriptive results and do not prove that municipal support leads to higher levels of integration.

3.6. Thematic Analysis of the KSDLM: Emerging Themes for Waste Picker Integration

Qualitative document analysis of the King Sabata Dalindyebo Municipality Integrated Development Plan (IDP) Review 2025/2026 identified several themes relevant to waste picker integration. Although the IDP does not explicitly establish a dedicated waste picker integration program, it contains several waste management, recycling, infrastructure, and local economic development interventions that provide an enabling environment for integration. The themes identified in the document analysis were (i) institutional commitment to integrated waste management and waste minimization; (ii) development of recycling and resource-recovery infrastructure; (iii) recycling as a local economic development opportunity; (iv) cooperative and informal-sector development; and (v) a gap between enabling municipal programs and explicit institutional recognition of waste pickers. These themes complement the primary findings of the study that waste pickers do experience some municipal engagement and support but do not perceive themselves as fully integrated into the municipal waste management system.

3.6.1. Institutional Commitment to Integrated Waste Management and Waste Minimization

The IDP institutionalizes the improvement of municipal waste management through implementation of IWMP. Waste-management capacity building; waste minimization programs; improved refuse collection; additional waste infrastructure; environmental policy implementation; and funding of waste projects are some interventions planned by the municipality. Waste minimization programs in schools and communities and measures to address illegal dumping are also proposed. These commitments show that waste management is institutionalized in municipal planning but do not identify waste pickers as stakeholders responsible for or participating in the implementation of programs. This makes a clear distinction between broader improvements in municipal waste management and institutional integration of waste pickers.

Document analysis of the KSD local municipal waste management bylaws revealed that the provisions relating to recycling are limited to the handling of recyclable materials, specifically outlining requirements for their storage and transportation. The bylaws prescribe how recyclables should be separated, stored in containers, etc. and transported to collection or processing sites. They do not provide for integration/recognition of waste pickers into the municipal waste management system nor formal participation in recycling activities, decision-making processes or municipal programs for waste management. So, while the bylaws regulate operational management of recyclable waste, they are silent about measures to integrate waste pickers into recycling activities, decision-making processes or municipal programs for waste management. This means that policy gaps exist regarding social and economic inclusion of waste pickers in the local recycling sector.

3.6.2. Development of Recycling and Resource-Recovery Infrastructure

The second theme that emerged from the IDP was that the municipality was putting more emphasis on recycling and resource-recovery infrastructure. Buy-back centers have been developed in Mthatha East and Mthatha West (the Mthatha Buy Back Centre has been certified to operate for waste recovery), and a Material Recovery Facility at Qweqwe Landfill Site is proposed (feasibility study approved; business plan approved). These initiatives therefore potentially create institutional spaces through which recyclable material can be sorted, aggregated, stored, and marketed. They are particularly relevant to the problems identified by study participants (insufficient storage facilities; collection equipment and transport). In the participant survey, lack of transport was reported by 92.5%, lack of storage by 77.5%, lack of collection equipment by 67.5% and inadequate safety gear by 45%. However, the IDP does not explicitly state whether existing waste pickers will have access to these facilities, participate in their management or economically benefit from them. The planned infrastructure is thus an opportunity for integration rather than proof of completed integration.

3.6.3. Recycling as a Local Economic Development and Employment Opportunity

The IDP further frames recycling as an economic development opportunity rather than solely as a waste-management activity. Under its strategic interventions, the municipality identifies the promotion of recycling in communities as a sector with local economic development potential and proposes that the sector should be structured to advance local economic development. This commitment is further supported by the proposed recycling program for KSDLM, which will be implemented in the urban wards of Mthatha West, East and South. The budget for this program is about R10 million; it will run from July 2025 to June 2026 and create about 700 indirect jobs. These initiatives show that the municipality is becoming more aware of the economic benefits of recycling (creating employment and recovering resources) and its role in it. However, the IDP does not explicitly state that these

jobs are earmarked for waste pickers or whether current informal waste pickers will be given priority in this program. So, while the recycling value-chain program is a big avenue for integration, it will only work if existing workers are included deliberately rather than left behind by newly created formal recycling systems.

3.6.4. Cooperatives and Informal-Sector Development as Potential Integration Mechanisms

The findings suggest that institutional efforts have emphasized collective organization. However, the relatively limited representation of waste sorting and occupational health and safety training indicates that cooperative formation has not necessarily been accompanied by comprehensive technical capacity development. Participants also identified the need for stronger cooperation between waste pickers, municipal authorities, and private recycling companies. One of the participants said, "we need to have representative from the waste pickers forum who will sit in board meeting, where major decisions are taken for us to have a voice".

Another theme in the IDP is the municipal support for cooperatives; small, medium and micro enterprises (SMMEs); and informal economic activities. The municipality recognizes difficulties faced by cooperatives and small businesses (restricted access to markets, financing, information, and suitable support services). Its Local Economic Development framework provides provisions for cooperative development capacity-building infrastructure that facilitates informal economic activities. This fits with the primary data that 55% of participants belong to a waste picker group or cooperative; a municipal official said about 300 waste pickers have been organized into cooperatives. And 52.5% of participants reported they had received training, but it was mainly on how to form cooperatives (rather than technical skills for sorting waste or occupational health and safety). Since the IDP's general approach to cooperative development coincides with waste picker cooperatives being formed, collective organization seems a viable institutional channel for integration. However, because the IDP mentions cooperatives in general terms, but not specifically waste picker cooperative documentary evidence, it is an enabling institutional framework rather than a policy targeted at waste pickers.

3.6.5. Gap Between Enabling Municipal Programs and Explicit Waste Picker Integration

The most important cross-cutting theme from the document analysis was a gap between municipal investment in recycling and explicit institutional recognition of waste pickers. The IDP includes plans for waste minimization, buy-back centers, material recovery infrastructure, recycling value chains, cooperative development, and informal sector support, but no waste picker integration framework is established. In particular, the IDP does not explicitly provide for registration and profiling of waste pickers; representation in municipal waste-management decision-making; formal service agreements or contracts; guaranteed access to recyclable materials; occupational health and safety measures; specific transport and storage support for waste pickers; social protection; or preferential participation in planned recycling infrastructure. This documentary finding corresponds to participants' perceptions of integration, too. The study showed that 52.5% considered waste pickers partially integrated and 47.5% not integrated. So together, the evidence shows that KSDLM has created important enabling conditions for waste picker integration but not yet institutional integration as such.

3.7. Assessment of Waste Picker Integration Using the Seven-Step Guidelines

Integration of waste pickers in KSDLM was evaluated using a seven-step framework (prepare, partner, plan, enable, institutionalize, implement and revise). The assessment showed mixed results: communication (step 1), cooperative formation, training, and re-

cycling infrastructure (steps 2–3) were present, but participatory planning, institutional recognition, resource access and monitoring processes were lacking. Table 7 shows findings for each step and areas of need.

Table 7. Assessment of the implementation of the Seven-Step Waste Picker Integration Guidelines in King Sabata Dalindyebo Local Municipality (KSDLM).

Integration Step		Guideline Activity	Status	Evidence from KSDLM
Prepare	a.	Establish an internal waste picker integration team	✓	There is a dedicated internal integration team identified.
	b.	Learn about waste pickers and integration	✓	Municipal engagement with waste pickers demonstrates some awareness of their activities and needs.
	c.	Commit to implementing integration	✓	Municipal support and cooperative development indicate some commitment, but no formal integration commitment was verified.
	d.	Analyze existing commitments and programs	x	No evidence of a specific analysis of existing programs for waste picker integration.
Partner	a.	Connect with waste pickers	✓	85% reported being contacted by the municipality.
	b.	Engage, listen, and share information regularly	✓	Weekly meetings and WhatsApp communication were reported.
	c.	Establish an inclusive integration working group	x	No formal inclusive waste picker integration working group identified.
	d.	Develop a common understanding of the existing recycling system	✓	Municipal engagement and cooperative organization provide some evidence of stakeholder knowledge, but no joint system-mapping exercise was verified.
	e.	Support waste picker organization	✓	55% belonged to waste picker groups; a municipal official reported approximately 300 waste pickers organized into cooperatives.
Plan	a.	Rectify problems associated with existing recycling programs	✓	Support initiatives exist, but transport, storage, equipment and safety challenges persist.
	b.	Register all waste pickers	x	Cooperative registration support was reported, but comprehensive registration of individual waste pickers was not verified.
	c.	Meet waste pickers' most pressing needs	x	60% received municipal support, but substantial resource shortages remain.
	d.	Integrate waste pickers into new recycling programs	x	Recycling infrastructure and programs are identified in the IDP, but explicit inclusion of existing waste pickers is not established.
Enable	a.	Align by-laws, permits, policies and plans	x	No specific regulatory alignment for waste picker integration identified.
	b.	Secure relevant skills within the municipal integration team	x	No evidence confirming a designated team with appropriate integration skills.
	c.	Provide ongoing training to municipal officials	x	Waste picker training was reported, but specific training for municipal officials was not verified.
	d.	Conduct public awareness and education campaigns	✓	The IDP identifies waste minimization education in schools and communities, but waste picker-specific awareness activities were not verified.
	e.	Secure funds for waste picker integration	✓	The IDP identifies an approximately R10 million recycling program, but no dedicated waste picker integration allocation was confirmed.

Table 7. *Cont.*

Integration Step		Guideline Activity	Status	Evidence from KSDLM
Institutionalize	a.	Include integration in IDPs, IWMPs and business plans	✓	Broader recycling and cooperative initiatives are included, but an explicit waste picker integration program is absent from the analyzed IDP.
	b.	Establish waste picker integration KPIs	x	No dedicated waste picker integration performance indicators identified.
	c.	Monitor, evaluate and revise the WPIP	x	No documented monitoring and evaluation process for a Waste Picker Integration Plan (WPIP) was verified.
	d.	Establish a permanent integration platform	✓	Regular meetings and WhatsApp communication exist, but a formally constituted permanent platform was not verified.
	e.	Finalize and adopt the WPIP	x	No formally adopted WPIP identified.
Implement	a.	Implement all activities in the WPIP	x	Some integration-related activities are occurring, but implementation of an adopted WPIP could not be verified.
	b.	Monitor and evaluate implementation	x	No WPIP-specific monitoring and evaluation evidence identified.
Revise	a.	Revise the WPIP using implementation evidence	x	No documented WPIP review or revision identified.
	b.	Institutionalize changes in policies, planning documents and KPIs	x	No evidence of WPIP-driven revisions to municipal policies or performance indicators.

4. Discussion

4.1. Waste Pickers Within the Integrated Waste Management System and the Circular Economy

The findings of this study show that waste pickers are an important part of recycling, material recovery and waste diversion in KSDLM but are not fully integrated into the formal municipal waste management system. Most participants had been involved in waste picking for four to six years, suggesting that the activity represents an established livelihood strategy rather than a temporary means of survival. Some participants said they interacted with private recycling companies and local communities supported them, but only 52.5% considered waste pickers as partially integrated into the municipal waste management system (none were fully integrated). This is consistent with studies showing that waste pickers contribute significantly to urban recycling systems but are marginalized within formal municipal planning and governance structures [23,24].

These findings can be understood within the framework of IWM (waste hierarchy, resource recovery and stakeholder participation). Waste hierarchy refers to waste prevention, reduction, reuse, recycling, and recovery over final disposal to maximize resource efficiency and reduce environmental burdens [25,26]. For waste pickers, this means collecting, sorting, and recovering recyclable materials that would otherwise end up in landfills. So, they minimized waste but kept potentially valuable materials in the productive economy.

Waste pickers' contributions are also relevant for the circular economy (maintaining value of materials and resources through recovery, reuse, and recycling) [27,28]. But our findings show that participation in recycling activities does not necessarily lead to equitable access to economic benefits from resource recovery. Waste pickers recover recyclable materials, but their limited connections with private recycling companies limit their capacity to participate more effectively in formal recycling markets. Urban mining is one additional perspective on how waste pickers could contribute to resource recovery. Urban mining views discarded materials and waste streams as secondary sources of valuable resources (metals and other mineral materials). Ref. [29] notes that mineral recovery from mining residues and urban mining wastes contributes to sustainability, whereas [30] states that knowledge and technological approaches need to relate to practical applications in the

informal electronic waste recycling sector. Within KSDLM, improved sorting practices, access to appropriate equipment and technical training could enhance waste pickers' ability to recover valuable materials, but increased involvement in potentially hazardous waste streams would also require occupational health and safety measures.

The document analysis further shows that KSDLM increasingly sees recycling as an environmental management activity and an opportunity for local economic development. The IDP lists recycling initiatives (buy-back centers, proposed Material Recovery Facility and a recycling value-chain program estimated at R10 million, with 700 indirect employment opportunities expected): these indicate institutional commitment to strengthening resource recovery and recycling activities, but the IDP does not say whether existing waste pickers will benefit from these opportunities or participate in the management and implementation of the programs. This distinction is important because improvements in municipal recycling infrastructure and resource recovery do not automatically include informal workers already involved in these activities. Thus, strengthening the contribution of waste pickers to IWM and the circular economy will require recognition of their existing activities, as well as access to infrastructure, recycling markets, technical skills, and institutional support.

4.2. Socio-Economic Dimensions of Waste Picking and Social Sustainability

4.2.1. Gendered Character of Waste Picking

The findings indicate that women constitute the majority of waste pickers in KSDLM, highlighting the gendered dimensions of informal waste recovery and its relationship with broader socio-economic inequalities. The high proportion of female participants suggests that waste picking provides livelihood opportunities for women who may experience barriers to participation in formal employment; many participants had been waste picking for several years (so informal recycling activities sustain household livelihoods). These results corroborate previous studies, which showed that women are represented in informal waste economies because of poverty, unemployment, and socio-economic marginalization (women waste pickers also may have a double burden: income-generating activities and unpaid domestic responsibilities) [31,32]. Studies have also shown that informal waste picking offers livelihood opportunities for women, young people and other socially marginalized groups who have limited access to formal employment (25,33). For example, in Bengkulu City, waste picking was found to be a livelihood strategy among economically disadvantaged women who combined income-generating activities with household responsibilities [33].

From a social sustainability perspective, waste picking is an important source of income for people who have limited access to formal economic opportunities [25]. But the contribution of waste picking to household livelihoods must be considered alongside working conditions and institutional arrangements under which these activities take place. Waste pickers help with municipal recycling and environmental management but often face occupational risks, insecure livelihoods, and little institutional protection.

These findings therefore show how waste picker integration relates to social sustainability. IWMS is not just about environmental efficiency but inclusive governance, worker protection and equitable participation in waste management systems [25]. Studies have shown that inclusive approaches (cooperation between municipalities and waste picker organizations) can enhance participation and environmental sustainability outcomes [34]. In KSDLM, the continued marginalization of waste pickers in formal municipal arrangements raises questions of environmental justice: waste pickers manage the environment but are socio-economically vulnerable and have few institutional resources, so integration should protect livelihoods, improve working conditions, and recognize their contribution to municipal waste management (women and older waste pickers may face additional barriers to formal employment).

4.2.2. Education and Structural Unemployment

The educational status of the participants further explains the socio-economic conditions underlying waste picking in KSDLM. Most of the participants were educated (60% secondary education and 7.5% tertiary education). This does not mean that people who pick waste are illiterate or have no schooling at all, but rather that waste picking may be linked to structural problems like unemployment, poverty, and restricted access to formal labor markets.

These results contrast with studies elsewhere in developing countries where waste pickers have been found to be relatively poorly educated (many only have primary school or very little formal schooling) [35,36]. Studies at Brazilian dumpsites also found high levels of illiteracy or incomplete primary education among waste pickers [36,37].

The relatively high number of secondary-educated participants in KSDLM implies that education is not a guarantee of secure employment. This interpretation is supported by the literature, which associates informal waste recovery with poverty, structural inequalities, and limited opportunities in formal labor markets [37,38]. Thus, waste picking should not be understood only as an activity carried out by people without education but also as a livelihood strategy among people who are economically excluded.

4.3. Stakeholder Integration and Institutional Participation in KSDLM

Stakeholder participation is a key principle of Integrated Waste Management because waste governance must be based on cooperation between municipalities, communities, private recycling companies, informal recyclers, and other actors in the value chain [23,25]. Communication channels have been established with waste pickers, but these arrangements are not yet institutionalized.

Among participants, 85% had been contacted by the municipality through meetings or communication platforms (WhatsApp groups). These arrangements imply that initial mechanisms for communication and engagement have been put in place. Stakeholder forums, committees and joint planning platforms have also been cited as participatory approaches to improve coordination and inclusive waste governance [23]. But municipal contact does not necessarily mean meaningful participation in planning, decision-making and resource allocation: previous studies have identified situations where informal recyclers are consulted but excluded from substantive governance processes [15].

Connections between waste pickers and private recycling companies were limited; few participants reported such connections. This means that many waste pickers are not connected to formal recycling markets. Partnerships and formal arrangements between waste picker organizations and recycling companies have been shown to improve institutional recognition, market participation and opportunities within circular value chains [11,39,40]. Limited market access weakens bargaining power and limits the economic benefits that waste pickers get from recycling activities.

Document analysis provides an institutional lens on these results. KSDLM IDP lists commitments to integrated waste management, waste minimization, recycling infrastructure and community recycling, but waste pickers are not explicitly mentioned as formal stakeholders implementing programs. This highlights the difference between municipal commitment to improve recycling systems and institutional recognition of informal workers already involved in resource recovery. Taken together, the findings indicate that KSDLM has established communication and engagement arrangements, but these have not yet translated into institutional participation. Meaningful integration therefore requires more than consultation; it requires arrangements where waste pickers are given roles in municipal planning, program implementation and decision-making (inclusive and coordinated waste governance).

4.4. Cooperatives as Mechanisms for Waste Picker Integration Within the Integrated Waste Management Framework

The findings highlight the importance of cooperatives and organized waste picker groups as potential mechanisms for strengthening participation in municipal waste management. Of the participants, 55% belonged to waste picker groups or cooperatives, while many of these organizations had existed for less than one year. This suggests that collective organization among the sampled waste pickers is relatively recent. Interviews with municipal officials further indicated that approximately 300 waste pickers had been organized into cooperatives.

Within the IWM framework, cooperative structures can serve communication, collective representation and collaboration between municipalities and informal recyclers [2,41]. Organizing waste pickers into collectives may strengthen their capacity to interact with municipal authorities, access support programs and participate in recycling activities, but membership of a cooperative does not automatically translate into formal institutional integration.

Training was also part of the municipal support initiatives (52.5% of participants reported receiving training; cooperative formation was the most commonly reported training activity). This means that capacity-development initiatives so far have been mainly organizational development. Training and capacity development were found to be important mechanisms for strengthening stakeholder participation and institutional engagement in waste management systems [11].

However, the findings also show that training was limited. While cooperative formation was well covered, very few activities were reported for waste sorting or occupational health and safety training. Technical and operational training needs to be strengthened alongside cooperative development; this is needed for better waste handling practices, occupational safety, and operational capacity of waste picker organizations.

Membership in cooperatives was also related to municipal support (participants in cooperatives were more likely to report receiving municipal assistance than those operating independently). This may be because organized groups provide municipalities with more accessible structures through which resources and support can be coordinated; the descriptive nature of the study does not show a causal relationship between cooperative membership and municipal support. An issue that follows from this pattern is exclusion of independent waste pickers. Cooperative structures can integrate, but if assistance is directed towards organized groups, then individuals who are not part of cooperatives will be left out. Similar concerns have been expressed in the literature, where formalization through collective organizations creates benefits for members but excludes non-members [1,42].

The IDP analysis also supports the idea that cooperative development can contribute to waste picker integration: support for cooperatives; small, medium, and micro enterprises (SME); and informal economic activities are listed in the municipality's local economic development framework, but these provisions are general and do not explicitly refer to arrangements specifically for waste picker cooperatives. So existing cooperative-development mechanisms offer opportunities for integration, but effectiveness depends on whether they are linked to municipal recycling programs, infrastructure, markets, and institutional participation. The findings suggest that KSDLM could increase integration by linking waste picker cooperatives to existing recycling initiatives (buy-back centers, proposed Material Recovery Facility, and recycling value-chain programs); but integration arrangements should also include independent waste pickers so as not to create further forms of exclusion.

4.5. Infrastructure and Operational Challenges Limiting Effective Integrated Waste Management

The findings highlight infrastructural and operational constraints as major barriers to waste picker integration in KSDLM. Infrastructure, collection equipment, transport and

occupational protection are necessary for effective resource recovery and environmentally sound waste management [43]. However, participants reported large shortages that limit their ability to collect recyclable materials, transport them, sort them, store them, and market them.

Transport was the most common challenge reported, followed by inadequate storage facilities and insufficient collection equipment. These limitations affect the operational efficiency of waste recovery since recycling activities rely on materials being moved between collection points, storage facilities and recycling markets (inadequate transport may restrict access to recycling facilities and buyers; insufficient storage exposes recyclable materials to damage, loss, or quality deterioration). Similar challenges have been described among waste picker organizations operating with limited infrastructure and insecure working spaces [44,45].

Occupational health and safety were also an important issue. Participants said they did not have access to protective equipment, and training in occupational health and safety was a small proportion of the training activities reported (previous studies found informal waste pickers are exposed to physical, biological, chemical, ergonomic, and social hazards that can cause injuries and adverse health outcomes [46,47]). Brazil, Bangladesh, Tanzania, Ghana, and Nigeria have also identified occupational risks and inadequate protective equipment among informal waste workers [47]. These conditions need to be considered when integrating waste picker programs.

Yet despite these obstacles, the study showed that most participants felt supported by their communities. This is important because community recognition could help socialize waste pickers (and lay the foundation for collaborative recycling initiatives), as previous studies have shown that informal recyclers are often stigmatized and marginalized, while increased recognition of their environmental contributions can strengthen their social legitimacy and support inclusive waste governance [44,45].

The document analysis also shows that KSDLM has recycling infrastructure development as a municipal priority (IDP: buy-back centers in Mthatha East and Mthatha West and Material Recovery Facility at Qweqwe Landfill Site). These initiatives are relevant to the operational challenges raised by participants since such facilities could offer opportunities for sorting, storage, and aggregation of recyclable materials.

However, the IDP does not state whether existing waste pickers will have access to these facilities or participate in their management. This is important because infrastructure development does not guarantee better working conditions or economic opportunities for informal recyclers; therefore, how these facilities contribute to waste picker integration depends on arrangements that ensure access and participation.

The findings suggest that infrastructure and occupational safety issues need to be addressed for municipal waste recovery activities to be more effective: support for transport, storage, collection equipment, protective gear and occupational training could increase waste pickers' operational capacity (improve working conditions) while supporting more inclusive municipal waste management.

4.6. Implementation of the Seven-Step Waste Picker Integration Guidelines in KSDLM

The study findings show how far waste picker integration activities in KSDLM fit with the Department of Environment, Forestry and Fisheries (DEFF) Seven Step Waste Picker Integration Guidelines, which set out a framework for preparation, partnering, planning, enabling, institutionalizing, implementing, and revising waste picker integration arrangements. Comparison between findings from this study and these stages shows progress has been uneven, with more stakeholder engagement and cooperative support than formal institutional integration.

4.6.1. Preparation and Partnership Development

The preparation and partnership stages focus on municipal readiness, stakeholder engagement, communication, and organization of waste pickers. KSDLM has done some activities in these stages (municipal contact, meetings, communication platforms and cooperative organization). The high percentage of participants reporting municipal contact indicates that communication between waste pickers and the municipality has taken place. Cooperative development also suggests collective organization strengthening and engagement with structures at the municipal level, but we do not know if a separate internal waste picker integration team or inclusive working group coordinating integration activities was created within the municipality. These findings suggest that engagement has occurred, but the formal institutional structures needed to coordinate stakeholder participation are not yet in place.

4.6.2. Planning and Enabling Waste Picker Integration

Planning and enabling stages include identification of waste pickers' needs, inclusion in recycling programs and institutional and operational support. KSDLM technical and material assistance, cooperative development and training were found. IDP lists recycling infrastructure, waste minimization programs and local economic development programs that could create opportunities for waste picker participation (for example). Yet transport, storage facilities, collection equipment and protective gear shortages continue, so existing support has not met operational needs as identified by participants. The IDP does not explicitly set up a registration system for waste pickers nor indicate how existing waste pickers will participate in new recycling programs. These findings indicate that although enabling activities have been started, the link between municipal recycling programs and informal waste pickers' needs has not been sufficiently developed.

4.6.3. Institutionalization of Waste Picker Integration

Institutionalization means that waste picker integration is embedded in municipal planning documents, institutional responsibilities, performance indicators and implementation arrangements. From the documents, KSDLM has included broader waste management priorities in its IDP (implementation of Integrated Waste Management Plan, waste minimization, infrastructure development and cooperative support), but no explicit program for waste picker integration is mentioned in the IDP. In particular, the documentary evidence does not show a formally adopted Waste Picker Integration Plan; integration performance indicators; or formal arrangements guaranteeing waste picker participation in municipal recycling programs. Municipal communication and cooperative organization are present, but this is not institutionalized. The findings thus indicate a gap between the municipality's broader commitment to recycling and formal recognition of waste pickers in municipal waste governance structures.

4.6.4. Implementation, Monitoring and Revision

Implementation and revision stages translate integration plans into practice; monitor progress; and revise institutional arrangements based on implementation outcomes. Some integration activities are taking place in KSDLM (municipal communication, cooperative formation training and material support). But we do not know whether these activities are part of a formally adopted Waste Picker Integration Plan. Similarly, although regular meetings and communication platforms offer engagement opportunities, the study did not find a dedicated monitoring and evaluation framework for waste picker integration. The analyzed IDP does not explicitly set out procedures for revising integration arrangements based on monitoring results, either. So, the evidence does not show that a formal

integration plan was systematically implemented and revised. Overall, the assessment shows that KSDLM has laid important foundations for waste picker integration (stakeholder engagement and cooperative development), but these activities have not yet been consolidated into institutional arrangements. This is consistent with the overall finding that integration is incomplete and reinforces the need for municipal planning, formal recognition, implementation mechanisms and continuous evaluation.

4.7. Development Context and Differentiated Approaches to Waste Picker Integration

The findings of this study should also be interpreted in terms of socio-economic and institutional conditions within which waste picking takes place. Approaches to waste picker integration are not likely to be uniform across countries because municipal capacity, waste management infrastructure, recycling markets, labor market conditions, regulatory frameworks and social protection systems vary considerably [16].

Waste picker integration is therefore both a waste management and development issue. In many low- and middle-income countries, rapid urbanization, increasing waste generation, limited municipal service capacity and persistent socio-economic inequalities make informal recycling important; waste pickers recover materials that would otherwise not be in formal recycling systems, and they depend on these activities for their livelihoods. So, integration means not only efficiency of waste management but livelihood protection, social inclusion, and institutional recognition [23,48,49].

In low-income and less-developed settings (municipal collection systems, recycling facilities, etc. may not exist), integration priorities might be to first create the basic conditions for safe and productive participation; recognition of waste pickers; access to collection and sorting facilities; transport and storage; occupational safety; collective organization; access to recycling markets; etc. Formalization in such settings should take into account financial and institutional constraints on informal workers rather than imposing requirements that exclude them further [29].

Protection of existing livelihoods is also mentioned in the literature. Integration can improve material recovery and strengthen connections with recycling value chains when policies acknowledge and support workers already involved in the sector [50]. On the other hand, approaches that ignore existing informal recycling activities may reinforce exclusion and livelihood insecurity.

In developing and emerging economies where municipal waste management arrangements are more developed and recycling markets exist, integration may be more about structured participation in service delivery and circular economy activities. Municipalities can collaborate with waste picker cooperatives through source-separated collection arrangements; service agreements; access to sorting and storage facilities; and partnerships with recycling companies. Examples from Pune, Belo Horizonte and Bogotá show different institutional approaches through which organized pickers have participated in municipal recycling and waste management, but integration arrangements depend on local governance structures and implementation conditions [51,52].

In higher-income countries with more developed waste management infrastructure and institutional systems, integration priorities may be stronger on decent work conditions, occupational safety, social protection, legal recognition, skills development, and participation in higher-value resource recovery activities. Informal recycling is not limited to developing countries; the nature of waste picker participation also varies across institutional and economic contexts [53].

KSDLM findings are relevant to municipalities where informal recycling is a resource recovery mechanism, but institutional integration is incomplete. The operational challenges identified in the study (weaknesses in private-sector linkages, formal municipal recogni-

tion gaps), together with infrastructure development (infrastructure funding), livelihood protection and institutional participation, all need to be combined.

Overall, the international comparison shows that waste picker integration should not be uniform but should be context-specific. Immediate priorities may differ across development contexts, but recognition of waste pickers, working condition improvement, equitable participation and protection of existing livelihoods are still relevant considerations.

4.8. Practical and Policy Recommendations for Waste Picker Integration

These findings have implications for municipal and national policies to integrate waste picker activities into sustainable waste management systems. KSDLM has conducted communication, cooperative development, training, and recycling infrastructure programs, but these activities have not resulted in full integration. Therefore, the findings suggest that existing initiatives need strengthening (institutional arrangements, operational support, and inclusive participation).

At the municipal level, KSDLM should develop a formal waste picker integration mechanism in line with its Integrated Waste Management Plan and other municipal planning instruments (municipal officials, waste picker organizations, independent waste pickers, private recycling companies and community stakeholders relevant to them). A permanent platform for engagement would provide opportunities for joint planning, problem-solving, monitoring and evaluation beyond informal communication arrangements. The municipality should also create and maintain an inclusive waste picker registration system. Registration should apply to both cooperative members and independent pickers and not be punitive (limiting access to livelihood opportunities). A register could help identify waste pickers, coordinate training and material assistance, and access municipal recycling program infrastructure and collection opportunities.

Operational support should therefore be a priority. The needs in transport, storage, collection equipment and occupational safety are large (see also above). Municipal support should therefore aim at access to shared transport; sorting and storage facilities; and collection equipment and protective gear. Existing and planned recycling infrastructure (buy-back centers and the Material Recovery Facility) might offer some ways of addressing these constraints if waste pickers are explicitly included in their operation and management. Strengthening market connections is another priority. The low proportion of participants who report interactions with private recycling companies suggests arrangements are missing that connect waste pickers to formal recycling markets. The municipality could support partnerships between cooperatives and recycling companies; access to information on recyclable material prices and quality requirements; and transparent arrangements for collection, weighing and payment (e.g., by setting up a collection center). Where institutional and legal arrangements exist, municipal recycling service agreements could offer additional opportunities for participation.

Waste picker representatives should also be consulted on decisions about recycling programs, landfill operations, source separation, infrastructure development and access to recyclable materials. Participation should go beyond consultation into meaningful involvement in program design, implementation and evaluation. Institutional recognition would increase, while municipal initiatives would meet the experiences and operational needs of waste pickers. The national government needs to support municipalities in implementing the existing Waste Picker Integration Guidelines (technical guidance and financial assistance for recognition, occupational protection, stakeholder participation, infrastructure development and access to recycling markets). National frameworks should provide consistency of integration principles but also allow municipalities to tailor implementation arrangements to institutional capacity and local conditions.

Dedicated funding mechanisms could support resource-poor municipalities in conducting integration activities. Funding should not only be provided for awareness campaigns (short-term) but also for recycling infrastructure; occupational health and safety programs; cooperative development; market access; and monitoring and evaluation. Investments in these areas would address operational barriers identified by KSDLM, as well as support the sustainability of municipal integration initiatives over time. Collaboration between environmental authorities, labor institutions, social development departments, economic development agencies and cooperative-development organizations is also necessary. Waste picker integration goes beyond waste management because it includes employment, livelihood security, occupational protection, and social inclusion; coordination across institutional areas could therefore increase the effectiveness of integration policies and programs.

Finally, the municipality should systematically implement the seven-step Waste Picker Integration Guidelines (clear responsibilities, integration activities in municipal planning documents, performance indicators, monitoring, and review). This would translate municipal commitments into more structured and accountable integration arrangements. Taken together, the recommendations stress that integration of waste pickers should not be about eliminating informal waste picking but rather progressive improvement of existing activities (safer working conditions, institutional recognition, access to resources and markets) to participate meaningfully in municipal waste management. This would move from partial and informal participation towards a more inclusive economically viable and environmentally sustainable system of waste management.

5. Conclusions

This research has illustrated that waste pickers are major players in the Integrated Waste Management system of King Sabata Dalindyebo Local Municipality, which involves recycling, recovering materials and landfill diversion. By means of evidence, they demonstrate that waste pickers are major contributors to the environment and the economy of the municipality but are also characterized by poor infrastructure, labor insecurity, and limited institutional recognition. The research also revealed the partial but not yet finalized integration of waste pickers in the municipal waste management system and communication platforms; municipal support, co-operative formation, or training programs were suggested as emerging attempts to bring waste pickers into the process, yet most of them have limited access to institutions and institutional support, formal recycling markets, and the decision-making framework. The research indicated that cooperatives and training programs increased the participation, visibility and institutional involvement of waste pickers and made waste pickers a more central focus within the agenda of inclusive waste governance strategies. But huge barriers—lack of transport, inadequate storage facilities, poor collection equipment, poor Occupational Safety and Health support and inconsistent municipal support—constrain organizational capacity, limit income opportunities, and prevent meaningful incorporation in formal waste governance mechanisms. Overall, the study concluded that better use of guidelines toward waste picker integration and municipalities embracing the approach of being more inclusive in waste picker engagement, treating them as legitimate players in sustainable waste management, would be necessary.

The municipal document shows increasing municipal commitment to integrated waste management, waste minimization, recycling, resource recovery, cooperative development, and local economic development. Planned buy-back centers, a Material Recovery Facility and a value-chain recycling program are important opportunities for strengthening resource recovery and creating livelihoods, but waste pickers are not explicitly placed within these interventions as formal partners or guaranteed beneficiaries; no mechanisms exist for recognition, representation, occupational protection, access to infrastructure and recyclable

materials, market participation and involvement in municipal decision-making, indicating a gap between an enabling recycling environment and waste picker integration.

5.1. Theoretical and Practical Contributions of the Study

Theoretical and practical lessons on the integration of waste pickers, integrated waste management and the circular economy are provided in this research. Theoretically, it argues that waste picker integration needs to be studied holistically (combining DEFF's seven-step Waste Picker Integration Guidelines with EE, SSE and CE principles). The findings show that meaningful integration is not only formalization of informal workers but recognition, participation, protection, cooperation, infrastructure development, market access, and institutional inclusion rather than a linear process. This implies that in KSDLM contexts, circular economy strategies must take social and institutional factors into account, as well as material recovery and resource efficiency.

This study also helps us understand waste pickers as active players in the circular economy and socio-environmental dynamics rather than just marginalized informal workers. Waste pickers already recycle, recover resources, and divert waste from landfills, but their limited institutional recognition limits how much these contributions can be integrated into formal waste management systems. The rise of cooperatives means that Social Solidarity Economy principles (collective organization, cooperation, participation, and reciprocity) are an institutional bridge between informal livelihoods and formal waste governance: if non-members are not accommodated within these structures, formalization through collective organizations may lead to new forms of exclusion. Thus, the KSDLM case contributes to discussions on inclusive circularity by showing that integration needs to be organizationally effective and socially inclusive.

From an empirical point of view, this study provides location-specific evidence from KSDLM (a municipality with urban, peri-urban, and rural areas with ongoing waste management problems and socio-economic challenges). It shows that integration of waste pickers cannot be measured by whether communication or cooperative structures exist; 85% of participants said they communicated with municipal authorities, but no participants perceived waste pickers as fully integrated—communication does not mean institutional integration. So, this research adds to the growing literature that recognition and engagement need material support as well as institutional occupational assistance.

Practically, these results have several implications for municipal waste management planning and policy implementation. First, KSDLM should involve waste pickers explicitly in its IWM planning processes (roles/responsibilities defined; mechanisms for participation). Existing forums for meetings and communication should be strengthened so that waste pickers move from being receivers of information to active participants in decisions about collection areas, use of recyclable materials, infrastructure improvements, training programs and recycling activities. Second, municipal support should address operational challenges as outlined in the study. Any integration initiatives must include transport solutions (e.g., vehicles), storage for collected materials (bins or containers), collection equipment (e.g., bins) and sorting spaces (sorting machines) and protective gear (gloves); this would increase resource recovery efficiency while reducing the physical burden on waste pickers. Thirdly, training should not be limited to cooperative formation. The emphasis on cooperative formation implies that organizational development is already part of integration, but other areas (occupational health and safety; sorting and classifying waste; recycling methods; entrepreneurship skills; market demands; environmental stewardship; cooperative business management; productive capabilities; and protective measures) need attention too. Fourthly, KSDLM should strengthen linkages between waste picker cooperatives and private recycling firms, as well as other stakeholders in the recycling sector.

Market linkages could provide access to reliable buyers, information on material pricing standards and quality requirements, etc., which would stabilize income for waste pickers, but partnerships must be based on transparent arrangements to avoid unfair bargaining power.

The local government should identify indicators of integration (recognition efforts, participation levels, protection measures, infrastructure availability, training opportunities, market access, and partnership developments) that are measurable locally (meetings held, registering cooperatives directly with waste collectors, etc.) Regular monitoring and evaluation will track progress towards substantial integration (not just meetings or cooperative registrations). In this sense, the practical contribution of this study is in turning national integration principles into actionable local strategies for resource-poor municipalities.

5.2. Limitations of the Study

King Sabata Dalindyebo Local Municipality was the only municipality studied, with its own socio-economic conditions and waste management challenges. Findings may not be generalizable to all South African municipalities or waste picker systems in other countries. Forty waste pickers were purposively and snowball sampled (study population = KSDLM waste pickers), which limits statistical generalization to the whole population of waste pickers in KSDLM and does not capture variations among different waste pickers.

The qualitative-dominant mixed-methods approach was not aimed at causal relationships but rather understanding participants' experiences. Therefore, findings are sample-specific and should not be used to represent population estimates. Findings on municipal and community support were based on self-reports of participants, so perceptions might have been affected by individual perception. Additional evidence was gathered, but some practices were not fully observable. The study also only captured the moment of waste picker integration, so we could not assess whether cooperatives or municipal engagement would be sustainable in the long run; and although it looked at integration from the perspectives of participants and documents relevant to integration, it did not assess the economic value of waste pickers' contributions (change in income) or changes in their income which may inform future assessments. These limitations set the boundaries within which findings should be interpreted. But the study does provide insights into waste picker integration and helps efforts to make municipal waste governance more inclusive.

5.3. Future Research

Future research should build on the findings of this study through comparative and longitudinal studies of waste picker integration in municipalities with different socio-economic and institutional conditions. Comparative research among urban, peri-urban, and rural municipalities could establish how the capacity of municipal governments, recycling-market development, infrastructure, and policy implementation influence integration outcomes; longitudinal studies would also be useful to determine whether cooperatives are formed (municipal support), seven-step guidelines are implemented (cooperation) and livelihoods, occupational safety, participation, and resource recovery improve over time.

Quantitative research should also quantify the environmental and economic contribution of waste pickers in KSDLM (volume and types of recyclable materials recovered, landfill diversion, income generated and potential municipal cost savings). Such evidence could make an economic case for investment in infrastructure and formal partnerships with waste picker organizations. Research should also look at independent waste pickers who are not members of cooperatives to see whether current formalization strategies exclude workers outside organized structures; and future studies should examine which municipal

integration models work best and develop indicators for monitoring progress towards equitable sustainable socially inclusive waste picker integration.

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Abbreviations

The following abbreviations are used in this manuscript:

CE	Circular Economy
DEFF	Department of Environment, Forestry and Fisheries
DSI	Department of Science and Innovation
EE	Ecological Economics ILO-International Labour Organization
IWM	Integrated Waste Management
KSD	King Sabata Dalindyebo
KSDLM	King Sabata Dalindyebo Local Municipality
MISA	Municipal Infrastructure Support Agent
NGOs	Non-Governmental Organizations
PPE	Personal Protective Equipment
SSE	Social and Solidarity Economy
WS	Walter Sisulu

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